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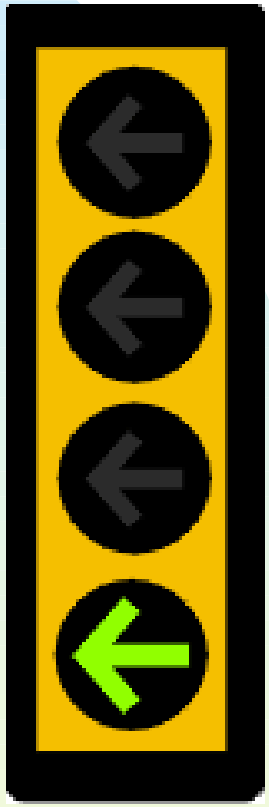
Four-Section Protected-Permissive Flashing Yellow Arrow Traffic Signal Head

Richard E. Mullinax, PE
Signals and Geometrics Engineer



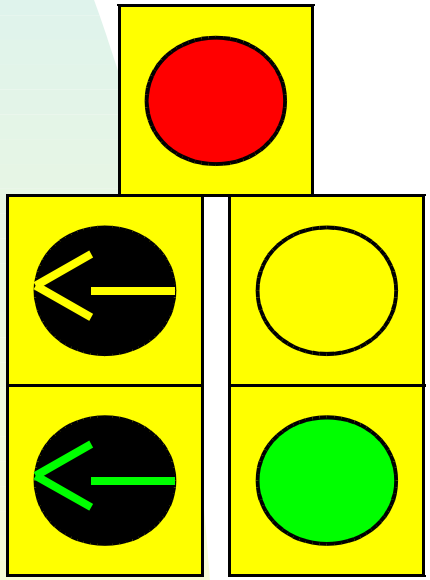
Introduction

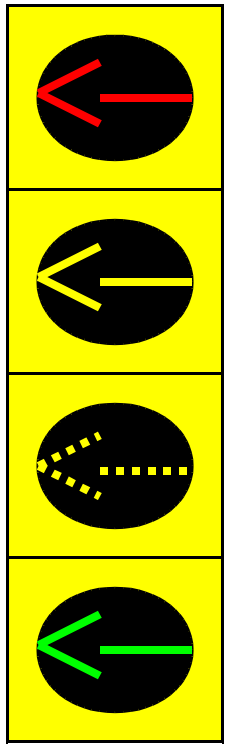
- What is the “four-section protected-permissive flashing yellow arrow traffic signal head?”
- The national experience.
- The North Carolina experience.
- Where are we going?

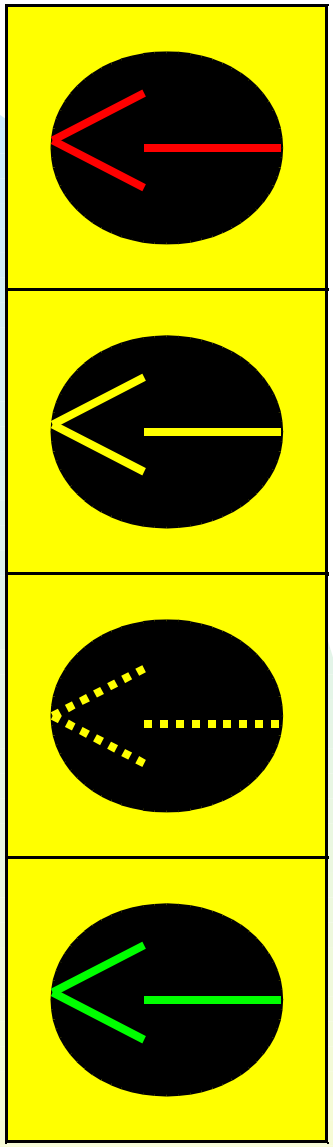
“What is the four-section protected-permissive flashing yellow arrow traffic signal head?”

“What is the four-section protected-permissive flashing yellow arrow traffic signal head?”

- It is a potential alternative to the 5-section “doghouse” or cluster traffic signal head currently used in North Carolina.







Solid Red Arrow – Stop. No turns are allowed.

Solid Yellow Arrow – Prepare to stop. Clearance for both, green arrow and flashing yellow arrow.

Flashing Yellow Arrow – Left turns are allowed, but first they must yield to oncoming traffic and pedestrians.

Solid Green Arrow – Left turns allowed, and they do not need to yield to oncoming traffic and pedestrians. Proceed with caution.

Advantages

- Research indicates it is the most intuitively understood display for motorists.
- Eliminates the “Yellow-Trap” by tying the flashing yellow arrow to the opposing green ball.
- Versatility - Can be used for different phasing schemes.
- Promotes nationwide consistency for protected-permitted displays.

National Study of Four-Section Protected-Permissive Flashing Yellow Arrow Traffic Signal Head

- Transportation Research Board study sponsored by AASHTO in cooperation with FHWA
- 228 individual locations nationwide were approved for implementation.
- Insufficient crash data was provided to FHWA to draw conclusions.
- What drivers say they will do and what they actually do in the driving environment is not always consistent!
- Field data / observations supported a higher understanding of the flashing yellow arrow display.

National Study (Continued)

- Drivers are confused by circular green indication and often assume it provides right-of-way during permissive left-turn intervals.
- Drivers interpret the flashing yellow arrow display correctly.
- Five-section cluster demonstrated significantly more fail-critical responses compared with a flashing yellow arrow.
- Flashing yellow arrow demonstrated a higher fail-safe response compared with a circular green.

National Study (Continued)

- Flashing yellow arrow was successfully implemented in the field with very few technical or political issues.
- Flashing yellow arrow is the only display that provides a universal solution for different intersections.

Traffic Engineers' Perspective

On the national level, traffic engineers favor the new display.

- Provides an exclusive signal display for left turn control.
- Indications are flashing, which attracts more attention.
- Indications provide enhanced operational control.

National Public Opinion

Comments from the public have generally been positive.

- “I like the flashing yellow arrows much better than the “combo” signals.”
- “I witnessed an accident…and one comment from the man at fault was that he had the solid green circle.”
- “I have noticed my own reaction. When I see a green light…my trained response is to “go.””
- “This amber arrow clearly said to us the first time we encountered one-”you may make a turn with caution.””

NCDOT Experience
Implemented Locations

(3 Isolated Locations)

- NC 132 (College Rd) at K-Mart/Outlet Mall in Wilmington, New Hanover County (SIN 03-0212) - Implemented November 2005
- SR 2911 (New Bern Ave) at Visitor's Entrance to WakeMed in Raleigh, Wake County (SIN 05-0905) - Implemented February 2005
- NC 87 at SR 1115 (Buffalo Lakes Road) in Spout Springs, Harnett County (SIN 06-0716) - Implemented February 2006

NCDOT Experience
Planned for Implementation

(6 Isolated Signals)

- US 158 (Croatan Hwy) at SR 1206 (Kitty Hawk Rd) in Kitty Hawk, Dare County (SIN 01-0260)
- US 258 at SR 1001 (Paul's Path Rd) / SR 1557 (Hull Rd) in Kinston, Lenoir County (SIN 02-0451)
- NC 24 at SR 1141/1144 (Hibbs Road Extension) in Morehead City, Carteret County (SIN 02-0470)
- NC 132 (South College Rd) at Holly Tree Rd in Wilmington, New Hanover County (SIN 03-0362)
- NC 55 / SR 1402 (Broad St) at NC 55 (Ennis St) in Fuquay-Varina, Wake County (SIN 05-2252)
- NC 5 (Beulah Hill Rd) at SR 1205 (Morganton Rd) / Golf Terrance in Pinehurst, Moore County (SIN 08-0346)

NCDOT Experience
Planned for Implementation

(2 Corridors)

- US 401 Business (Raeford Road) from Brighton Road to Purdue Drive / Highlands Shopping Center in Fayetteville, Cumberland County (4 Signals)

- US 401 (Ramsey Street) from Stacy Weaver Road / Methodist College to Northgate Shopping Center / Wendy's in Fayetteville, Cumberland County (6 Signals)

05-0905

SR 2911 (New Bern Ave) at Visitor's Entrance to WakeMED

(Raleigh, Wake County)

SR 2911 (New Bern Ave) at Visitor's Entrance to WakeMED in Raleigh, Wake County.

Crash Statistics

- Target Crashes - Left Turn, Same Roadway and U-Turn Crashes
- Before Crash Reports - February 1, 2002 through January 31, 2005 (3 Years Before)
- After Crash Reports - March 31, 2005 through February 28, 2006 (1 Year After)
- Before Crashes - 28 in 3 years (9.3 per year)
- After Crashes - 5 in 1 year
- **Reduction - 46.4%**

03-0212

NC 132 (College Rd) at K-Mart / Outlet Mall (Wilmington, New Hanover County)

NC 132 (College Rd) at K-Mart / Outlet Mall in Wilmington, New Hanover County.

Crash Statistics

- Target Crashes - Left Turn, Same Roadway and U-Turn Crashes
- Before Crash Reports - November 1, 2002 through October 31, 2005 (3 Years Before)
- After Crash Reports - December 1, 2005 through November 30, 2006 - PENDING
- Before Crashes - 11 in 3 years (3.7 per year)
- After Crashes - PENDING

06-0716

NC 87 at SR 1115 (Buffalo Lake Rd)

(Spout Springs, Harnett County)

NC 87 at SR 1115 (Buffalo Lakes Rd) in Spout Springs, Harnett County.

Crash Statistics

- Target Crashes - Left Turn, Same Roadway and U-Turn Crashes
- Before Crash Reports - February 1, 2003 through January 31, 2006 (3 Years Before)
- After Crash Reports - March 1, 2006 through February 28, 2007 (1 Year After) - PENDING
- Before Crashes - 9 in 3 years (3.0 per year)
- After Crashes - PENDING

NCDOT Traffic Engineers' Perspective

- Initial Opinions Were Skeptical- "You are going to get someone killed."
- Proof has been "in the pudding." Site visits by field and office personnel to the New Bern Avenue at WakeMED location have convinced almost all engineers.
- Final Opinions Are In Support - "Motorists' actually appear to understand what it means."

North Carolina Public Comment

Comments in NC have mirrored the nation.

- “Years ago, I was riding with a friend, who had her license for a few months at that time. Then one day, we almost crashed...I expected her to come to a slow stop and yield to oncoming traffic. Instead, she didn't look at the traffic, only to glance at the solid green light that stood before us.”
- “I think the flashing yellow arrows that indicate left turns are permitted while yielding is a fantastic idea... The modification will help tremendously with preventing accidents and hopefully saving lives.”
- “I'm a nurse at WakeMed and I LOVE the new light!!”

Where Are We Going?

- Until March 2006, agencies were required to submit evaluation sites individually.
- In March 2006, FHWA issued an Interim Approval for Optional Use.
- In May 2006, NCDOT requested Interim Approval for Optional Use.
- In June 2006, NCDOT received Interim Approval for Optional Use.
- 2008 MUTCD ?

- Device is NOT yet an MUTCD approved display.
- Department MUST maintain an inventory of all locations.
- Sites MUST be restored to a condition that complies with the MUTCD within 3 months of Final Ruling.
- Use MUST be terminated any time significant safety concerns are attributed to the device or its application.

Where Are We Going?

- As of June 30, 2006, eleven jurisdictions have Interim Approval from FHWA.
- States Agencies include: Wyoming, Washington*, Missouri, Oregon*, and North Carolina.
- Colorado and Michigan are in the pipeline.

*(Includes local jurisdictions.)

Where Are We Going?

- Primary display will remain the 5-section “doghouse” / cluster during the interim approval period.
- Use of four-section, protected-permissive, flashing yellow arrow will generally be limited to existing protected-permissive locations during the interim approval period.
- Locations should have either identified “correctable” crash patterns or be locations where “more restrictive” signal phasing would provide hardship.
- If included in the updated MUTCD, it may become the primary p/p display (TBD).
- No funding for replacements; cluster heads will still be acceptable.

Have a Location for Consideration?

- Submit a request to the Regional Traffic Engineer's office.
- Regional Traffic Engineer will coordinate with the Signals & Geometrics Engineer to evaluate.
- Consensus will be needed by:
  - Division Traffic Engineer
  - Regional Traffic Engineer
  - Signals & Geometrics Engineer
  - State ITS and Signals Engineer
  - Municipality Representative (where applicable).
- Traffic signal plans will need to be prepared.

Richard E. Mullinax, PE
Telephone: (919)733-5569
E-Mail: rmullinax@dot.state.nc.us